SECTION 1-D

WATER EROSION

INTRODUCTION

This section contains information on predicting soil erosion rates in Maryland. Conservation planners are encouraged to consult the NRCS National Agronomy Manual (NAM). It can be found at http://policy.nrcs.usda.gov/scripts/lpsiis.dll/M/M.htm .

The Revised Universal Soil Loss Equation (RUSLE) and the Gully Calculation Workbook are used to compute erosion rates. The erosion prediction models are empirical equations derived and tested by research. Both models are used to estimate the rate that soil is moving on critical areas of the landscape and are used as guides in the choice of conservation practices that will control erosion.

FORMS OF WATER EROSION

Forms of soil erosion by water include sheet and rill erosion, ephemeral gully, and classical gully. Each succeeding type is associated with the progressive concentration of runoff water into channels as it moves downslope. Sheet erosion, sometimes referred to interrill erosion, is the detachment of soil particles by raindrop and runoff. Rill erosion is the formation of small, generally parallel channels formed by runoff water. Rills usually do not re-occur in the same place. Ephemeral gullies are concentrated flow channels formed when rills converge to form shallow channels. They are alternately filled with soil by tillage operations and re-formed in the same general location by subsequent runoff events. Classical gullies are also concentrated flow channels formed when rills converge. These are well defined, permanent incised drainage ways that cannot be crossed by ordinary farming operations. Other forms of erosion that are related to soil erosion by water include stream channel and geologic. Stream channel erosion refers to the degradation of channels and waterways. Geologic erosion refers to long-term erosion effects, as opposed to accelerated erosion events.

THE WATER EROSION PROCESS

The processes of sheet and rill erosion is detachment, transport, and deposition of soil particles caused by raindrop impact and surface runoff.

Detachment is the removal of particles from the soil mass and is expressed in units, such as tons per acre. When soil particles are removed from the mass, they are referred to as sediment. The movement of sediment downslope is sediment transport. A measure of sediment transport is sediment load. Sediment load on a slope increases with distance downslope as long as detachment is occurring. That is, detachment adds to the sediment load.

Where runoff is slowed at the base of a slope or by dense vegetation, deposition occurs, which is the transfer of sediment from the sediment load to the soil mass. That is, deposition removes sediment from the sediment load, and accumulates on the soil surface.

Two types of deposition, remote and local occur. Remote deposition occurs some distance away from the origin of the sediment. Deposition at the toe of a concave slope, on the uphill side of vegetative strips, and in terrace channels are examples of

remote deposition. Local deposition is where sediment is deposited near, within several inches, of where it is detached. Deposition in microdepressions and in low gradient furrows are examples of local deposition.

PRINCIPLES OF WATER EROSION CONTROL

The principle factors that influence soil erosion by water are:

- Climate
- Soil Properties
- Topography
- Vegetative Cover
- Conservation Practices

Climate and soil properties are conditions of the site and are not modified by ordinary management measures. Conservation treatment primarily involves manipulation of vegetative cover, modification of topography, and manipulation of soil conditions in the tillage zone. The greatest deterrent to soil erosion by water is vegetative cover, living or dead, on the soil surface. Cover and cultural practices influence both the detachment of soil particles and their transport. Growing plants and plant residue absorbs the energy of raindrops, decreases the velocity of runoff water, and helps create soil conditions that resist erosion. Cultural practices that affect vegetative cover includes crop rotations, cover crops, management of crop residue, and tillage practices.

NRCS estimates soil erosion by water as part of its technical assistance to land users. In conservation planning, erosion estimates are made for an existing management system and compared with alternative systems and with soil loss tolerance (T) values.

In addition, soil loss estimates are used to inventory natural resources, evaluate the effectiveness of conservation programs and land treatment, and estimate sediment production from fields that might become sediment yield in watersheds.

WATER EROSION TOOLS

This section contains the Excel Workbook containing the gully calculation model and instructions for using this model. The worksheet entitled 'data' shall not be manipulated.

The **RUSLE2** computer program is not available for Maryland Field Office use at this time. This section contains the interim paper version of RUSLE that will be used for all technical assistance until the RUSLE2 program is installed in the Field Offices and posted on this website. RUSLE2 will be implemented in 2004, at which time we will cease using this interim paper version.